

## PATENT ABSTRACTS OF JAPAN

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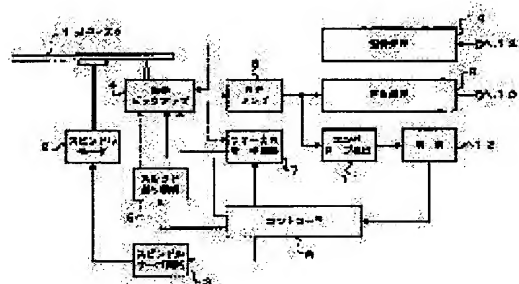
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## (54) OPTICAL DISK DRIVE DEVICE

(57)Abstract:

**PROBLEM TO BE SOLVED:** To make simply discriminatable the kind of an optical disk loaded in a device.**SOLUTION:** An envelope of reproduced signal obtained by detecting a laser beam reflected by an optical disk 1 in a state in which a focus position of a laser beam irradiating a disk 1 is adjusted to a signal recording surface is detected by an envelope detecting circuit 11, a state of top position of the detected envelope is discriminated by a discriminating circuit 12, and the kind of an optical disk is discriminated.

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CLAIMS

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[Claim(s)]

[Claim 1]An optical disk drive device comprising:

An optical pickup which irradiates a signal recording surface of an optical disc with a laser beam.

A focus control means which performs focus control of a laser beam with which the above-mentioned optical pickup irradiates.

A detection means to detect an envelope of a regenerative signal with which the above-mentioned focus control means detected and obtained a laser beam which reflected a focusing position with an optical disc in the state where it doubled with the above-mentioned signal recording surface.

A discriminating means which distinguishes a kind of the above-mentioned optical disc from a state of a top position of an envelope which the above-mentioned detection means detected.

[Claim 2]Have a thread informer stage which sets up a thread position of a laser beam with which the above-mentioned optical pickup irradiates in the optical disk drive device according to claim 1, and where thread delivery is performed, the above-mentioned thread informer stage, An optical disk drive device which distinguishes a kind of the above-mentioned optical disc from a state of a top position of an envelope which the above-mentioned detection means detected.

[Claim 3]When it distinguishes that a state of a top position is linear shape mostly as distinction by the above-mentioned discriminating means in the optical disk drive device according to claim 1, An optical disk drive device distinguished as it is the disk with which a track was formed of a groove when it distinguishes that it is the disk with which a track was formed of a pit and distinguishes that a state of a top position is wavelike.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the optical disk drive device which performs record, playback, etc., for example on disks (the disk of these is only called an optical disc below) which perform record and playback optically, such as an optical disc, a magneto-optical disc, and a phase change disk.

[0002]

[Description of the Prior Art]As a device which performs record and playback of an optical disc, the thing corresponding to the optical disc in two or more kinds of formats is developed. For example, the optical disc in a format called CD (Compact Disc), The optical disk reproducing device which enabled it to play the both sides of the optical disc in a format called DVD (Digital Video Disc or Digital Versatile Disc) is developed.

[0003]In the case of the device corresponding to two or more kinds of such optical discs, it is necessary to set up distinguish the kind of optical disc with which the device was equipped first, and perform corresponding signal processing.

[0004]Here, in the format of CD which was mentioned above, and the format of DVD, since numerical values, such as thickness of a disk and a track pitch, differ greatly, a disk kind can be distinguished comparatively easily.

[0005]

[Problem(s) to be Solved by the Invention]However, even if fundamental numerical values, such as thickness of a disk, are the same, the optical disc of the method with which regeneration methods differ is developed, and it may be unable to be coped with by the conventional disk type discriminating method in recent years. For example, besides the disk called DVD or DVD-ROM only for playback as a disk specified into the group of DVD, The added-a postscript type disk (namely, disk which cannot perform elimination of the recorded data) called DVD-R (DVD-Recordable), and the disk of rewritable type called DVD-RW (DVD-Rewritable) are proposed. These DVD-Rs and the disk of DVD-RW have set numerical values, such as thickness of a disk, and a track pitch, as the almost same value as DVD only for playback fundamentally.

[0006]These disks are with DVD only for playback, and rewritable DVD-RW, need to change the laser intensity at the time of playback, and need to distinguish the kind of these disks, for example. However, it was impossible to have distinguished a kind from the thickness of a disk, etc., as mentioned above.

[0007]An object in view of this point of this invention is to be able to be made to perform distinction of the kind of disk simply.

[0008]

[Means for Solving the Problem]In order to solve this SUBJECT, this invention is in a state which doubled with a signal recording surface a focusing position of a laser beam with which a disk is irradiated, An envelope of a regenerative signal which detected and obtained a laser beam reflected with an optical disc is detected, and a kind of optical disc is distinguished from a state of a top position of the envelope.

[0009]In being the optical disc in which a track was formed, for example of a pit according to this composition, A top position of a playback envelope becomes linear shape mostly, and in being the optical disc in which a track was formed of a groove, a top position of a playback envelope becomes wavelike and it can perform kind distinction of a disk.

[0010]

[Embodiment of the Invention]Hereafter, an embodiment of the invention is described with reference to an accompanying drawing.

[0011]Drawing 1 is a block diagram showing the composition of the optical disk drive device of this example, and the optical disc 1 with which this device was equipped is rotated with the spindle motor 2. This rotation is controlled by the spindle servo circuit 3 by the predetermined state.

[0012]And the signal recording surface of the optical disc 1 rotated in this way is irradiated with the laser beam outputted from the laser light source (not shown) in the optical pickup 4. In this case, the position of the optical pickup 4 is set up by the thread feeding mechanism 5 based on control of the controller 6, and is considered as the composition which can irradiate the arbitrary radius positions of the optical disc 1 with a laser beam by the drive by this thread feeding mechanism 5. The focusing position of the laser beam with which the optical disc 1 is irradiated is controlled by the focus servo circuit 7. It is made to have changed the power of the laser beam with which a disk is irradiated by the optical pickup 4 of further this example according to the kind of disk with which it was equipped by control of the controller 6.

[0013]If signal processing at the time of playback is explained, the returned light of the laser beam with which the signal recording surface of the optical disc 1 was irradiated will be detected within the optical pickup 4, and the detecting signal will be outputted as a playback RF (high frequency) signal. After supplying and amplifying this regenerative RF signal to RF amplifier 8, it regenerates a recovery etc. in the reproducing processing circuit 9, and obtains regenerative data to the output terminal 10.

[0014]The regenerative RF signal which RF amplifier 8 outputs is supplied to the envelope detecting circuit 11, envelope detector processing is performed, and the changing condition of the top surface (upper limit) of the detection signal is distinguished in the discrimination circuit 12. The result distinguished in this discrimination circuit 12 is supplied to the controller 6. In the controller 6, discrimination processing of the kind of optical disc 1 with which the device was equipped is performed based on the data of this discriminated result. The details of this discrimination processing are mentioned later.

[0015]In being a disk which the optical disc 1 with which this device was equipped can record as signal processing at the time of record, The record data obtained by the input terminal 13 is supplied to the recording processing circuit 14, The modulation process for record, etc. are performed, a record signal is made to generate, the record signal is supplied to the optical pickup 4, it processes modulating the laser beam of the power for record with which the optical disc 1 is irradiated by a record signal etc., and recording processing is performed. About this recording processing, means (for example, magnetic field generating means for performing magnetic field modulation) other than an optical pickup may be used by the recording method applied to an optical disc.

[0016]Next, the discrimination processing of the kind of optical disc which is performed by control of the controller 6 and with which it was equipped is explained. The optical disc only for playback in which data was recorded by formation of the pit and the track was formed as the optical disc 1 with which a device is equipped here, Data is recordable on the position in which the track was formed of the groove (slot) by a phase change etc., and at least two kinds of disks with the rewritable optical disc which can play the recorded data are prepared.

[0017]Namely, in the case of the optical disc only for playback, as shown, for example in A of drawing 3, The pit sequences 21a and 21b and 21c.... to which the pit (hole) of the predetermined depth was allotted in the state based on a record signal are formed in the signal recording surface 21 of this disk 20, This pit sequence itself serves as a track, and the state of each pit sequence can be detected as a regenerative signal by performing tracking servo control which coincides the position with which a laser beam makes this pit sequence irradiate at the time of reproduction. As an optical disc of such composition, there is a disk called DVD only for playback, for example.

[0018]In the case of the rewritable optical disc, as shown, for example in A of drawing 4, the grooves (slot) 32a and 32b and 32c.... are formed in the signal recording surface of this disk 30 at the predetermined intervals, and the part between these grooves has become with the land 31. And each grooves 32a, 32b, and 32c .... A signal can be recorded and the phase change is made to detect at the time of reproduction by carrying out the phase change of the inner signal recording surface based on a record signal. In this case, tracking servo control at the time of record and reproduction is performed by detecting a groove. There is a disk called DVD-RW rewritable, for example as an optical disc of such composition.

[0019]A rewritable optical disc may record a signal by the phase change of the land 31, etc. depending on the case, or may record a signal on the both sides of a land in a groove. By drawing 3 and drawing 4, in order to explain simply, respectively, the track is shown in linear shape, but each track is actually turned at and formed in the circumferential direction of a disk. Although a certain protective film is actually formed on the signal recording surface of each optical disc, this protective film is omitted in drawing 3 and drawing 4.

[0020]When distinguishing two kinds of such disks 20 and 30, the controller 6 performs processing shown in the flow chart of drawing 2. Namely, when the controller 6 detects that the device was equipped with the disk (insertion) (Step 101), It processes moving the optical pickup 4 to a disk most-inner-circumference position according to the thread feeding mechanism 5 etc., and thread delivery of the optical pickup 4 is prepared (Step 102). The optical disc which made rotate the spindle motor 2 and with which it was equipped by the drive by the spindle servo circuit 3 in this state is made to rotate (Step 103). It is not necessary to make a spindle servo lock at this time.

[0021]In and the state where focus servo control of the laser beam was made to start by control by the focus servo circuit 7. Thread delivery of the optical pickup 4 is carried out at the rate of predetermined (Step 104), and the controller 6 distinguishes a disk kind from the discriminated result in the discrimination circuit 12 at this time (Step 105).

[0022]When the distinction state in the discrimination circuit 12 is explained here, in being the optical disc 20 only for playback as the disk with which it equipped shows to A of drawing 3, When thread delivery is performed so that a track may be crossed, where a focus servo is applied, As shown in B of drawing 3, as signal  $E_{10}$  by which an envelope detector is carried out value  $e_{11}$  of the top surface, It is set to an almost fixed level, and the phase of the catoptric light from a disk changes in the formation position (namely, track position) of a pit, a level falls, a level goes up before the next track, and, as for value  $e_{12}$  of a signal surface (bottom surface), a level changes wavelike.

[0023]In being the rewritable optical disc 30 as the disk with which it equipped shows to A of drawing 4, When thread delivery is performed so that a track may be crossed, where a focus servo is applied, As shown in B of drawing 4, as signal  $E_{20}$  by which an envelope detector is carried out value  $e_{21}$  of the top surface, Become a signal of the groove 32a and 32b.... which a level goes up in a formation position, and a level falls by the land 31, and changes wavelike, and value  $e_{22}$  of a signal surface, Grooves 32a and 32b .... The phase of the catoptric light from a disk changes in a formation position, and a level falls, and by the land 31, a level goes up and it changes wavelike.

[0024]Therefore, when a constant level is mostly distinguished as a top surface of the envelope detector value distinguished in the discrimination circuit 12, It judges that the controller 6 is the disk 20 only for playback, and when it is distinguished that a level changes wavelike, it can be judged that the controller 6 is the rewritable disk 30.

[0025]Each kind of disk can be appropriately regenerated now by setting the power of the laser beam at the time of playback as the corresponding value based on this judgment. Also when other processings need to be switched according to a disk kind at the time of playback, based on judgment of the disk kind, it can process appropriately.

[0026]Thus, according to this example, the kind of disk can be distinguished from the signal state of the top surface of the envelope detector signal of a regenerative RF signal when carrying out thread delivery of the optical pickup so that a track may be crossed where the focus servo of the laser beam from an optical pickup is applied.

Therefore, even if values, such as thickness of a disk and a track pitch, are the same by each kind of disk, a disk kind can be distinguished correctly and promptly and setting out of laser power, etc. can be processed exactly.

[0027]At the embodiment mentioned above, when distinguishing a disk kind, where thread delivery is carried out by a thread feeding mechanism, were made to perform discrimination processing, so that the laser beam from an optical pickup might cross a track, and. It may be made to distinguish a disk kind in the state where thread delivery is not carried out. Namely, also in the state where thread delivery is not performed, for example, in not carrying out tracking servo control. It is factors, such as eccentricity of a disk, and accuracy at the time of chucking of a disk, actually, and since it will be in the state where a laser beam crosses two or more tracks, it is possible to detect the same envelope signal and to distinguish a disk kind. However, if thread delivery is performed as the embodiment mentioned above explained, an envelope signal can be detected more certainly.

[0028]Although the embodiment mentioned above explained the case where two kinds of disks of the disk only for playback with which the track was formed of the pit, and the disk which records a signal on the disk with which the track was formed of the groove by a phase change were distinguished, As long as it is a disk which can be distinguished from the signal state of the top surface of the envelope detector signal of a regenerative RF signal, it may be made to distinguish the disk of other composition.

[0029]

[Effect of the Invention]According to the invention indicated to claim 1, according to the formed state of a track, the state of the top position of the envelope of a regenerative signal changes, and it becomes possible to distinguish the kind of disk from distinction of the state of the top position simply.

[0030]According to the invention indicated to claim 2, in the invention indicated to claim 1, discrimination processing of a disk kind can be more certainly performed by detecting an envelope, performing thread delivery.

[0031]According to the invention indicated to claim 3, in the invention indicated to claim 1, distinction with the disk with which the track was formed in the pit, and the disk with which the track was formed by the groove can be simply performed by distinction of whether the top position of a playback envelope is almost wavelike in linear shape.



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ーラ6の制御に基づいてスレッド送り機構5により設定され、このスレッド送り機構5による駆動で光ディस्क1の任意の半径位置にレーザ光を照射できる構成としてある。また、光ディस्क1に照射するレーザ光のフォーカス位置は、フォーカスサーボ回路7により制御される。さらに本例の光学ピックアップ4でディस्क1に照射するレーザ光のパワーは、コントローラ6の制御により、装着されたディスクの種類により変化させるようにしてある。

【0013】再生時の信号処理について説明すると、光ディस्क13の信号記録面に照射したレーザ光の戻り光を光学ピックアップ4内で検出して、その検出信号を再生RF（高周波）信号として出力する。この再生RF信号は、RFアンプ8に供給して増幅した後、再生処理回路9で復調などの再生処理を施して、再生データ出力端子10に得る。

【0014】また、RFアンプ8が出力する再生RF信号を、エンベロープ検出回路11に供給し、エンベロープ検波処理を行い、その検波信号のトップ面（上限値）の変化状態を、判別回路12で判別する。この判別回路12で判別した結果は、コントローラ6に供給する。コントローラ6では、この判別結果のデータに基づいて、装置に装着された光ディスク1の種類別の判別処理を行う。この判別処理の詳細については後述する。

【0015】記録時の信号処理としては、この装置に装着した光ディスク1が記録できるディस्कである場合には、入力端子13に得られる記録データを、記録処理回路14に供給して、記録用の変調処理などを行って記録信号を生成させ、その記録信号を光学ピックアップ4に供給し、光ディスク1に照射する記録用のパワーのレーザ光を記録信号で変調させる等の処理を行って、記録処理を行う。なお、この記録処理については、光ディスクに適用される記録方式により、光学ピックアップ4以外

の手段（例えば磁気変調を行うための磁気発生手段）を使用する場合もある。

【0016】次に、コントローラ6の制御により実行される装着された光ディスクの種類別の判別処理を説明する。ここでは装置に装着される光ディスク1として、ビットの形成によりデータが記録されると共にトラッキングの形成した再生専用の光ディस्कと、グループ（溝）によりトラッキングが形成された位置に、相変化したデータで記録することができると共に、その記録されたデータを再生することができる書き換え可能な光ディスクとの少なくとも2種類のディスクが用意されている。

【0017】即ち、再生専用の光ディスクの場合には、例えば図3のAに示すように、このディस्क200の信号記録面21に、所定の深さのビット（孔）が記録信号に基づいた状態で配されたビット列21a、21b、21c…が形成され、このビット列そのものがトラッキングとなり、再生時にはこのビット列にレーザ光の照射させる

【0022】ここで判別回路12での判別状態について説明すると、装着したディスクが図3のAに示すような再生専用の光ディस्क20である場合には、フォーカスサーボをかけた状態でトラッキングを検出するようにスレッド送りを行ったとき、エンベロープ検波される信号E10として、図3のBに示すように、信号面（ボトム面）の

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値e12は、ビットの形成位置（即ちトラッキング位置）でディスクからの反射光の位相が変化してレベルが低下し、次のトラッキングまでの間でレベルが上昇し、波状にレベルが変化する。

【0023】また、装着したディスクが図4のAに示すような書き換え可能な光ディस्क30である場合には、フォーカスサーボをかけた状態でトラッキングを検出するようにスレッド送りを行ったとき、エンベロープ検波される信号E20として、図4のBに示すように、そのトップ面の値e21は、グループ32a、32b…の形成位置でレベルが上昇し、ランド部31でレベルが低下し、波状に変化する信号となり、信号面の値e22は、グループ32a、32b…の形成位置でディスクからの反射光の位相が変化してレベルが低下し、ランド部31でレベルが上昇し、波状に変化する。

【0024】従って、判別回路12で判別されるエンベロープ検波値のトップ面として、ほぼ一定レベルが判別されるとき、コントローラ6は再生専用のディスク20であると判断し、波状にレベルが変化することが判別されるとき、コントローラ6は書き換え可能なディスク30であると判断できる。

【0025】この判断に基づいて、例えば再生時のレーザ光のパワーを対応した値に設定することで、それぞれ種類のディスクを、適切に再生処理できるようになす。また、ディスクの種類に応じて再生時にその他の処理を切換える必要がある場合にも、そのディスク種類の判断に基づいて、適切に処理できる。

【0026】このように本例によると、光学ピックアップからのレーザ光のフォーカスサーボをかけた状態で、トラッキングを検出するように光学ピックアップをスレッド送りさせたときの再生RF信号のエンベロープ検波信号のトップ面の信号形状からディスクの種類を判別することができ、従って、ディスクの厚さ、トラッキングピッチなどの値がそれぞれ種類のディスクで同じであっても、正確かつ迅速にディスク種類を判別でき、レーザパワーの設定などの処理を的確に行える。

【0027】なお、上述した実施の形態では、ディスク種類を判別する際に、光学ピックアップからのレーザ光がトラッキングを検出するように、スレッド送り機構でスレッド送りをしない状態で、ディスク種類を判別するようになっている。即ち、例えばスレッド送りが行われていない状態でも、トラッキングサーボ制御をしない場合

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には、実際にはディスクの凹凸や、ディスクのチャッキング時の精度などの要因で、レーザ光が複数のトラッキング状態になるため、同様のエンベロープ信号を検出して、ディスク種類を判別することが可能である。但し、上述した実施の形態で説明したようにスレッド送りを行えば、より確実にエンベロープ信号を検出できる。

【0028】また、上述した実施の形態では、ビットによりトラッキングが形成されたディスクに相変化した信号を記録するディスクとの2種類のディスクの判別を行う場合について説明したが、再生RF信号のエンベロープ検波信号のトップ面の信号形状から判別できるディスクであれば、他の構成のディスクを判別するようにしても良い。

【0029】  
【発明の効果】 請求項1に記載した発明によると、トラッキングの形成状態に応じて、再生信号のエンベロープのトップ位置の状態が変化し、そのトップ位置の状態の判別から簡単にディスクの種類を判別することが可能になる。

【0030】 請求項2に記載した発明によると、請求項1に記載した発明において、スレッド送りを行わずにエンベロープを検出することで、より確実にディスク種類の判別処理が行える。

【0031】 請求項3に記載した発明によると、請求項1に記載した発明において、再生エンベロープのトップ位置がほぼ直線状か波状かの判別により、ビットでトラッキングが形成されたディスクと、グループでトラッキングが形成されたディスクとの判別が簡単にできる。

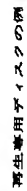
【図面の簡単な説明】  
【図1】 本発明の一実施の形態の構成を示すブロック図である。

【図2】 本発明の一実施の形態によるディスク種類判別処理を示すフローチャートである。

【図3】 本発明の一実施の形態によるビットでトラッキングが形成されたディスクの判別状態を示す説明図である。

【図4】 本発明の一実施の形態によるグループでトラッキングが形成されたディスクの判別状態を示す説明図である。

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【符号の説明】  
1…光ディスク、4…光学ピックアップ、5…スレッド送り機構、6…コントローラ、7…フォーカスサーボ回路、11…エンベロープ検出回路、12…判別回路



ディスク種別判別処理

